

EXPERIMENT NO. 5
SPECIFIC GRAVITY AND ABSORPTION
OF FINE AGGREGATES



GROUP NO.4

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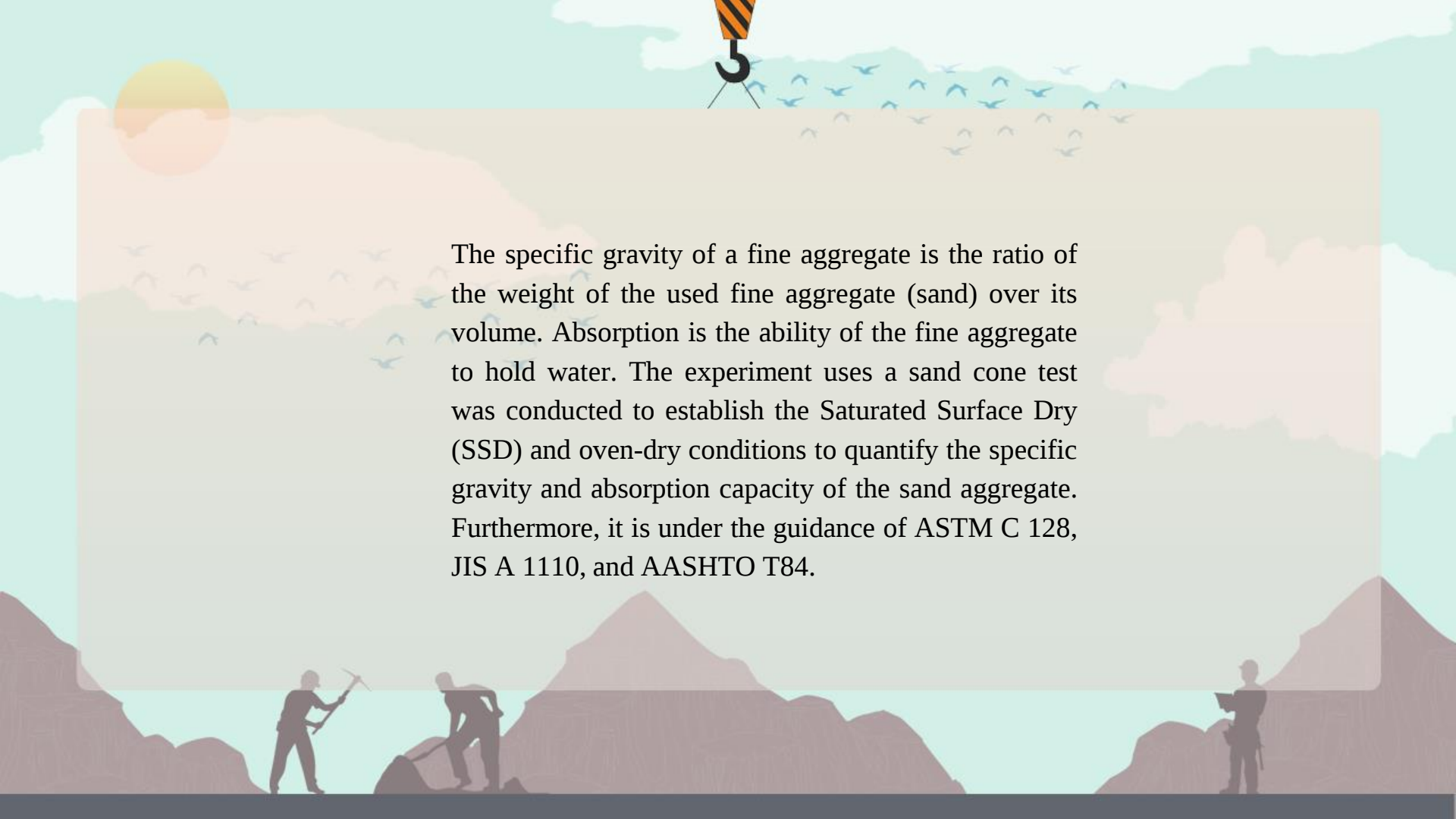
ONGTO, ARIANNA MICHAELA S.

FELIX, FRANCINE KYLE CHLOE G.

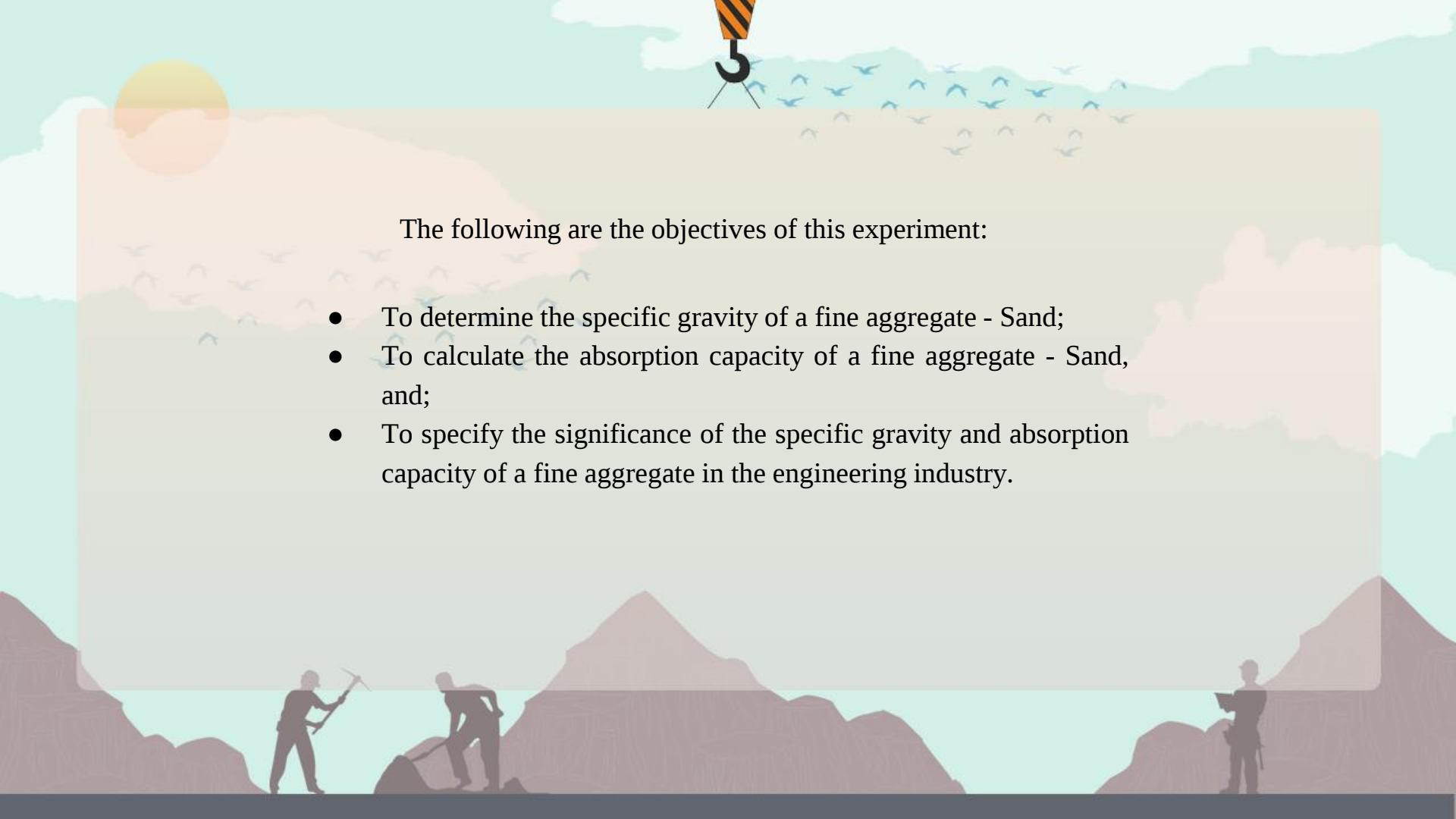
VILLANUEVA, DANIEL KENNETH.

The background is a stylized illustration. The top half features a light yellow sky filled with numerous small, dark green birds in flight. A black silhouette of a person stands on a thin vertical pole in the center. The bottom half shows a dark green city skyline with various building shapes. A large, dark green rectangular box is centered in the middle of the image, containing the word 'INTRODUCTION' in a pink, outlined, sans-serif font. A thin pink horizontal line is positioned below the text.

INTRODUCTION

The background features a stylized illustration of a construction site. At the top center, a crane with a black and yellow striped hook is visible. The sky is a light teal color, populated with numerous small blue birds in flight. A large, bright yellow sun is positioned in the upper left corner. The ground is depicted with dark brown, jagged silhouettes of hills or mountains. In the foreground, three workers are shown in silhouette: one on the left using a pickaxe, one in the center using a shovel, and one on the right holding a clipboard. A large, semi-transparent light orange rectangle is centered on the page, containing the text.

The specific gravity of a fine aggregate is the ratio of the weight of the used fine aggregate (sand) over its volume. Absorption is the ability of the fine aggregate to hold water. The experiment uses a sand cone test was conducted to establish the Saturated Surface Dry (SSD) and oven-dry conditions to quantify the specific gravity and absorption capacity of the sand aggregate. Furthermore, it is under the guidance of ASTM C 128, JIS A 1110, and AASHTO T84.

The background of the slide features a stylized illustration. At the top center, a crane hook with orange and black diagonal stripes is visible. The sky is a light teal color, populated with numerous small, dark blue birds in flight. A large, bright yellow sun is positioned in the upper left corner. The bottom of the slide shows a dark brown silhouette of a construction site with three workers. One worker on the left is using a pickaxe, another in the center is using a shovel, and a third on the right is holding a clipboard. The entire scene is framed by a large, semi-transparent light orange rectangle that serves as a backdrop for the text.

The following are the objectives of this experiment:

- To determine the specific gravity of a fine aggregate - Sand;
- To calculate the absorption capacity of a fine aggregate - Sand, and;
- To specify the significance of the specific gravity and absorption capacity of a fine aggregate in the engineering industry.



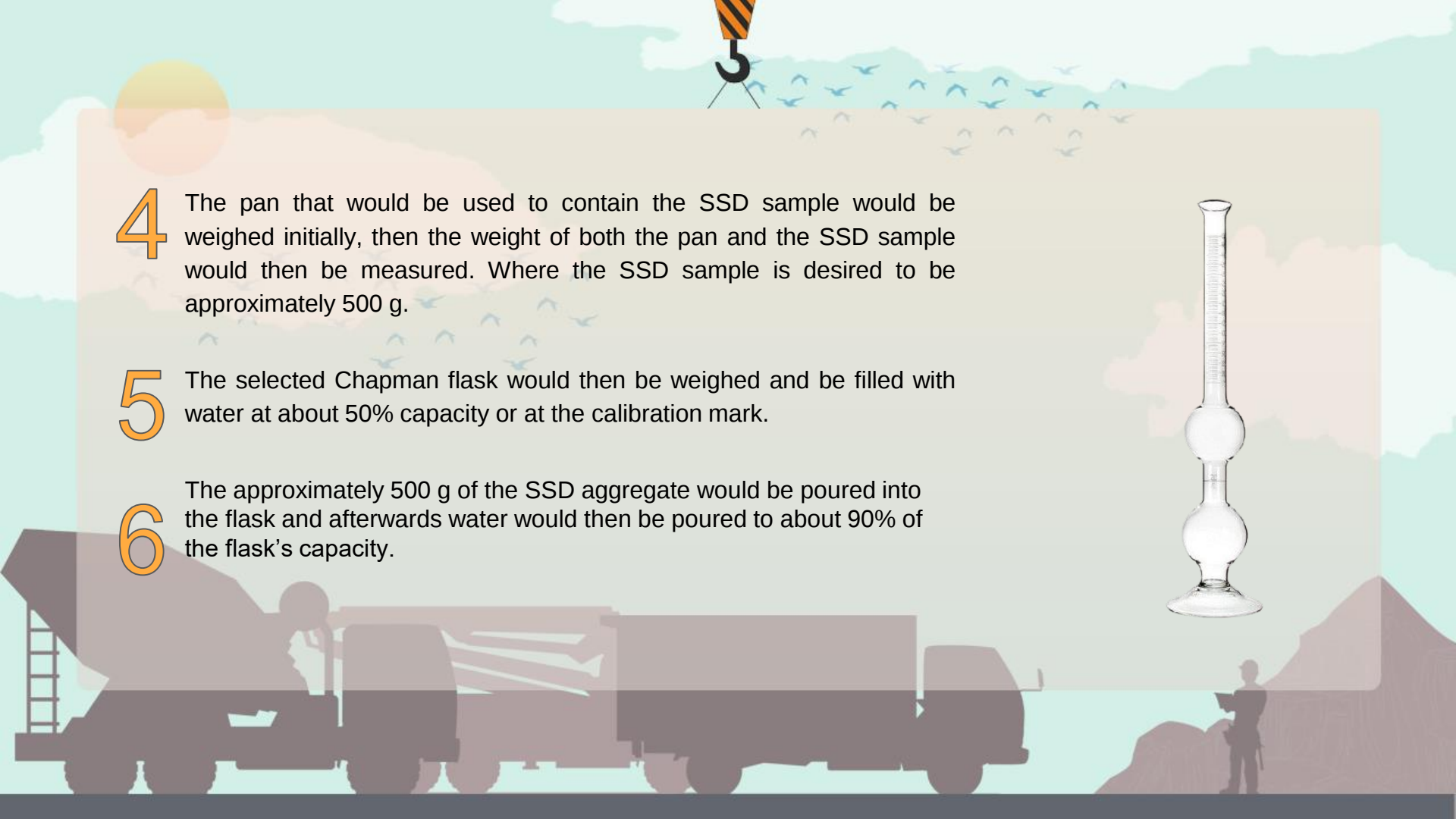
PROCEDURES

1 For a period of 24 hours or more, the sample of the selected aggregate would be soaked in water.

2 To determine the moisture condition of the sample, a cone test would be conducted. Where 25 drops from 5 mm above the sample level were applied.

3 To achieve homogeneous drying, the sample would be stirred frequently or periodically either through the use of a heat gun or regular hair dryer. The sand cone test would be repeated until the sample would be in a SSD condition, where the sample slimps lighty.



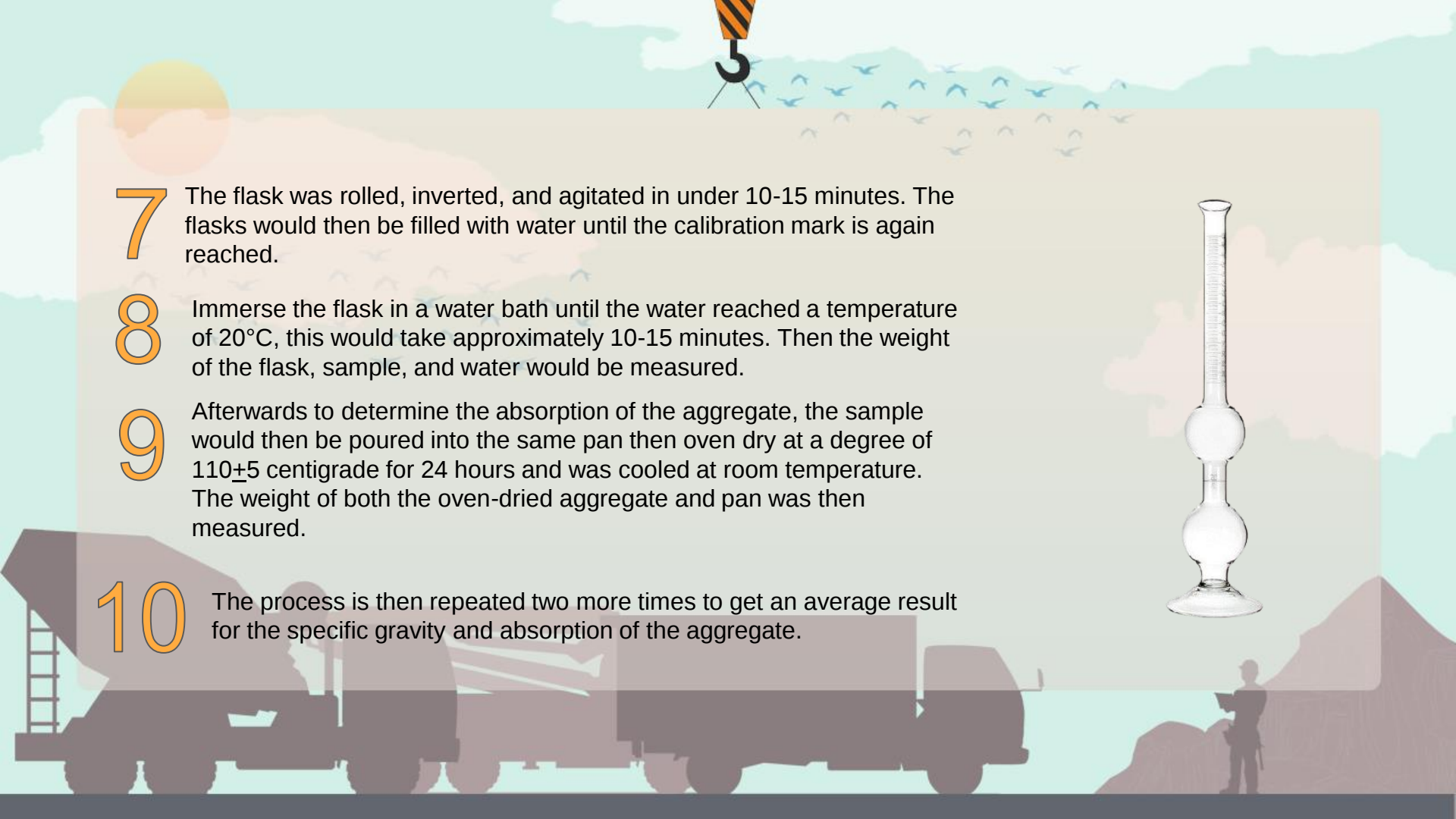


4 The pan that would be used to contain the SSD sample would be weighed initially, then the weight of both the pan and the SSD sample would then be measured. Where the SSD sample is desired to be approximately 500 g.

5 The selected Chapman flask would then be weighed and be filled with water at about 50% capacity or at the calibration mark.

6 The approximately 500 g of the SSD aggregate would be poured into the flask and afterwards water would then be poured to about 90% of the flask's capacity.





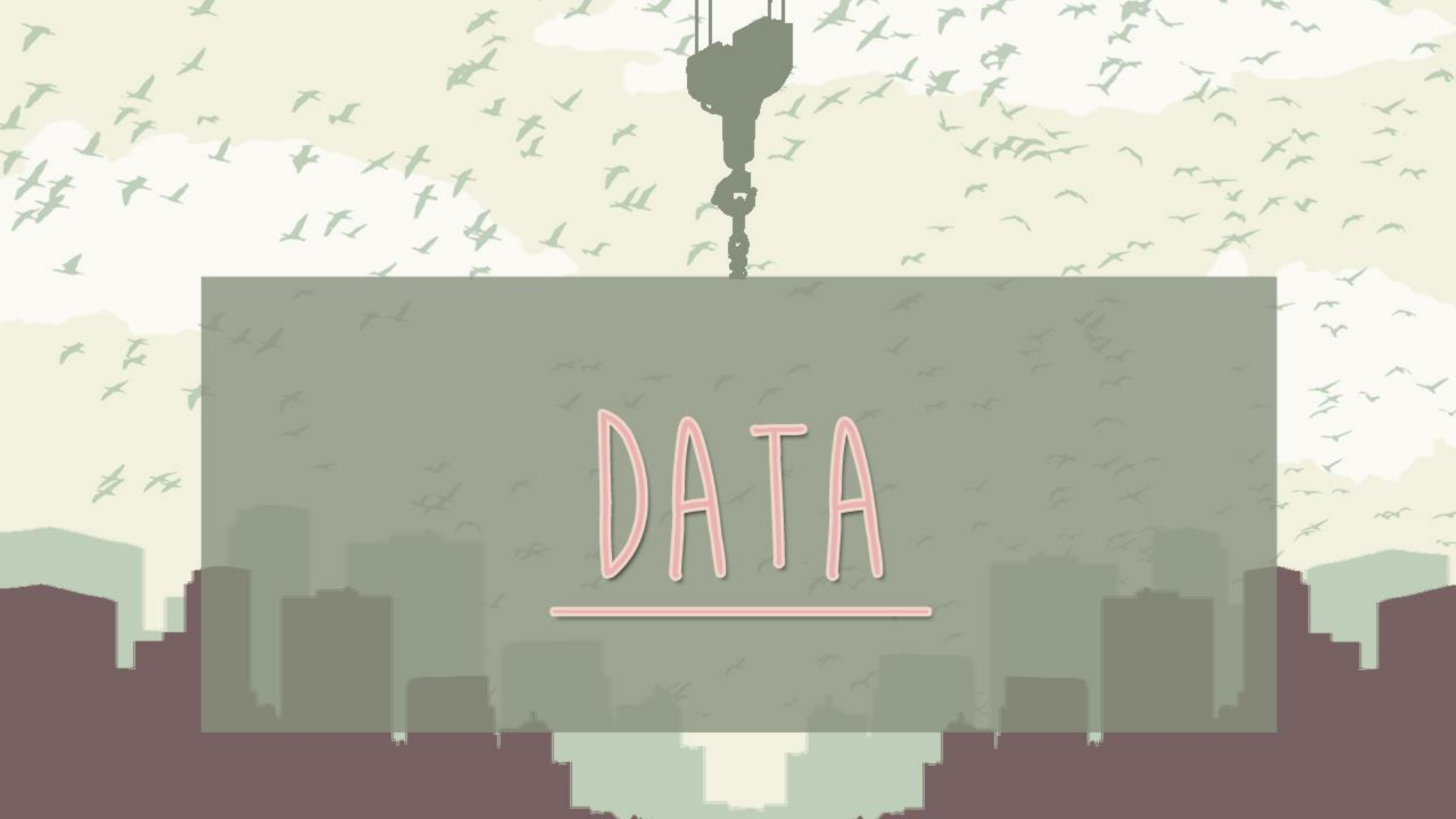
7 The flask was rolled, inverted, and agitated in under 10-15 minutes. The flasks would then be filled with water until the calibration mark is again reached.

8 Immerse the flask in a water bath until the water reached a temperature of 20°C , this would take approximately 10-15 minutes. Then the weight of the flask, sample, and water would be measured.

9 Afterwards to determine the absorption of the aggregate, the sample would then be poured into the same pan then oven dry at a degree of 110 ± 5 centigrade for 24 hours and was cooled at room temperature. The weight of both the oven-dried aggregate and pan was then measured.

10 The process is then repeated two more times to get an average result for the specific gravity and absorption of the aggregate.





DATA

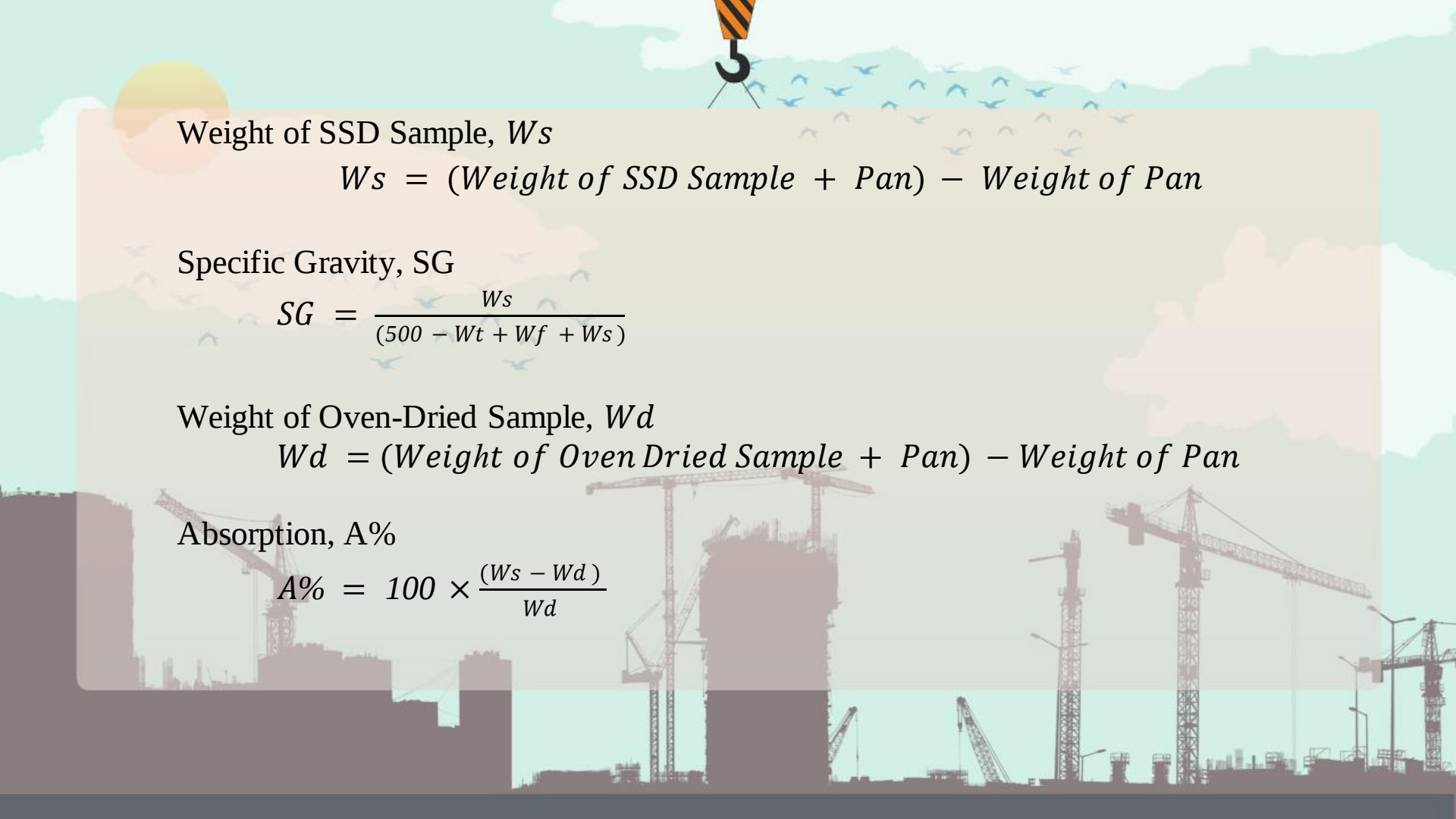
Table 1: Data Sheet for Specific Gravity and Absorption of Fine Aggregates

Test No.	1	2	3
1. Flask No.	1	2	3
2. Weight of Flask (Wf), g	180.2	167.1	175.3
3. Weight of Pan, g	383.4	346.3	428.9
4. Weight of SSD Sample + Pan, g	888.6	846.4	934.1
5. Weight of SSD Sample (Ws) = [4]-[3], g	505.2	500.1	505.2
6. Weight of Flask + Sample + Water (Wt), g	972.6	956.7	966.9
7. Specific Gravity = $[5] / \{500 - [6] + [2] + [5]\}$	2.374	2.376	2.365
8. Average Specific Gravity (SSD)	2.372		
9. Weight of Oven-Dried Sample + Pan, g	863.6	818.4	907.7
10. Weight of Oven-Dried Sample = [9] - [3], g	480.2	472.1	478.8
11. Absorption = $100 \times \{[5] - [10]\} / [10]$, %	5.206	5.931	5.514
12. Average Absorption, %	5.550		



Calculations:

- W_f – Weight of Flask
- W_s – Weight of SSD Sample
- W_t – Weight of Flask + Sample + Water
- W_d – Weight of Oven – Dried Sample



Weight of SSD Sample, W_s

$$W_s = (\text{Weight of SSD Sample} + \text{Pan}) - \text{Weight of Pan}$$

Specific Gravity, SG

$$SG = \frac{W_s}{(500 - W_t + W_f + W_s)}$$

Weight of Oven-Dried Sample, W_d

$$W_d = (\text{Weight of Oven Dried Sample} + \text{Pan}) - \text{Weight of Pan}$$

Absorption, A%

$$A\% = 100 \times \frac{(W_s - W_d)}{W_d}$$

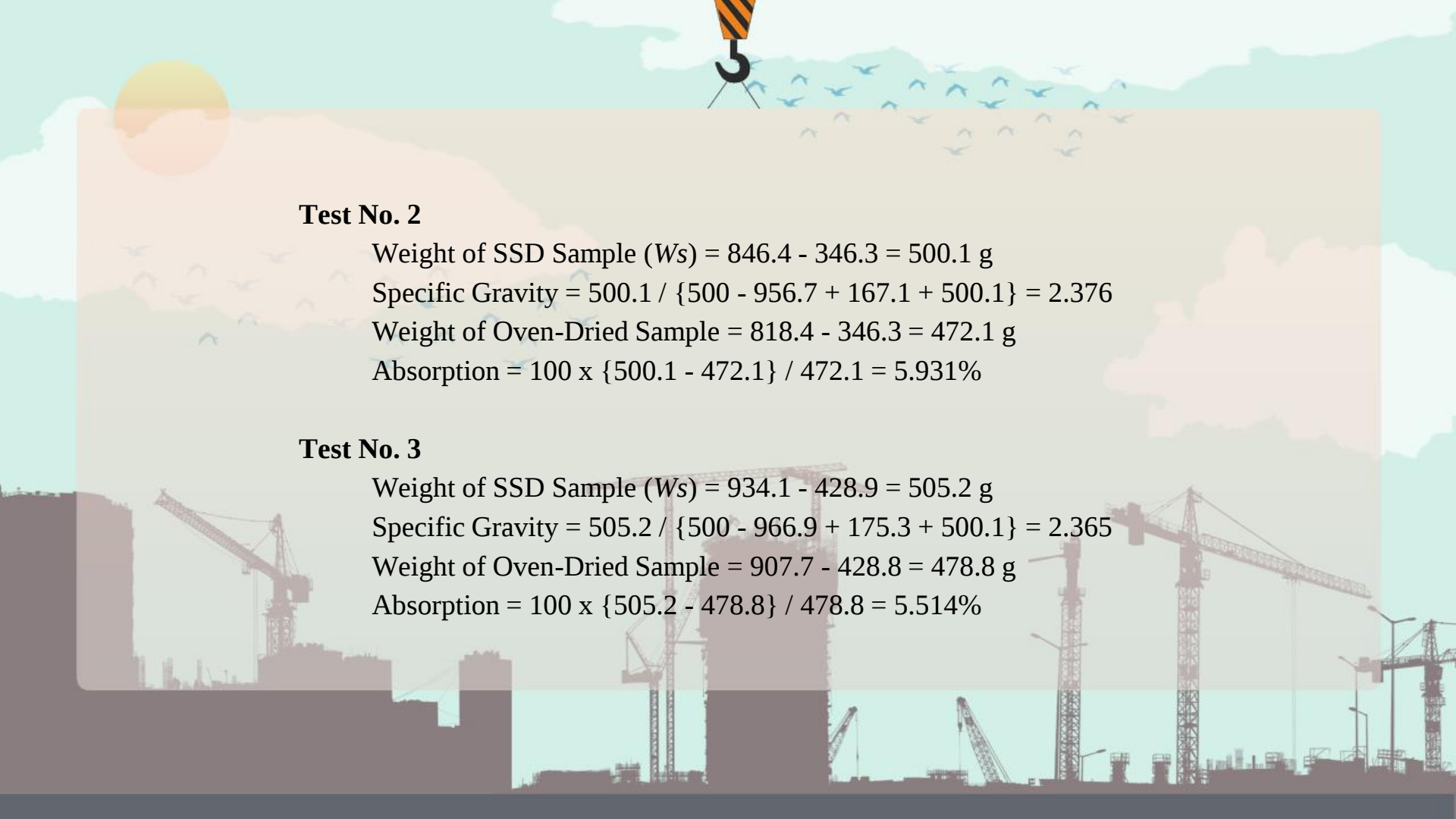
Test No. 1

Weight of SSD Sample (W_s) = $888.6 - 383.4 = 505.2$ g

Specific Gravity = $505.2 / \{500 - 972.6 + 180.2 + 505.2\} = 2.374$

Weight of Oven-Dried Sample = $863.6 - 383.4 = 480.2$ g

Absorption = $100 \times \{505.2 - 480.2\} / 480.2 = 5.206\%$



Test No. 2

Weight of SSD Sample (W_s) = $846.4 - 346.3 = 500.1$ g

Specific Gravity = $500.1 / \{500 - 956.7 + 167.1 + 500.1\} = 2.376$

Weight of Oven-Dried Sample = $818.4 - 346.3 = 472.1$ g

Absorption = $100 \times \{500.1 - 472.1\} / 472.1 = 5.931\%$

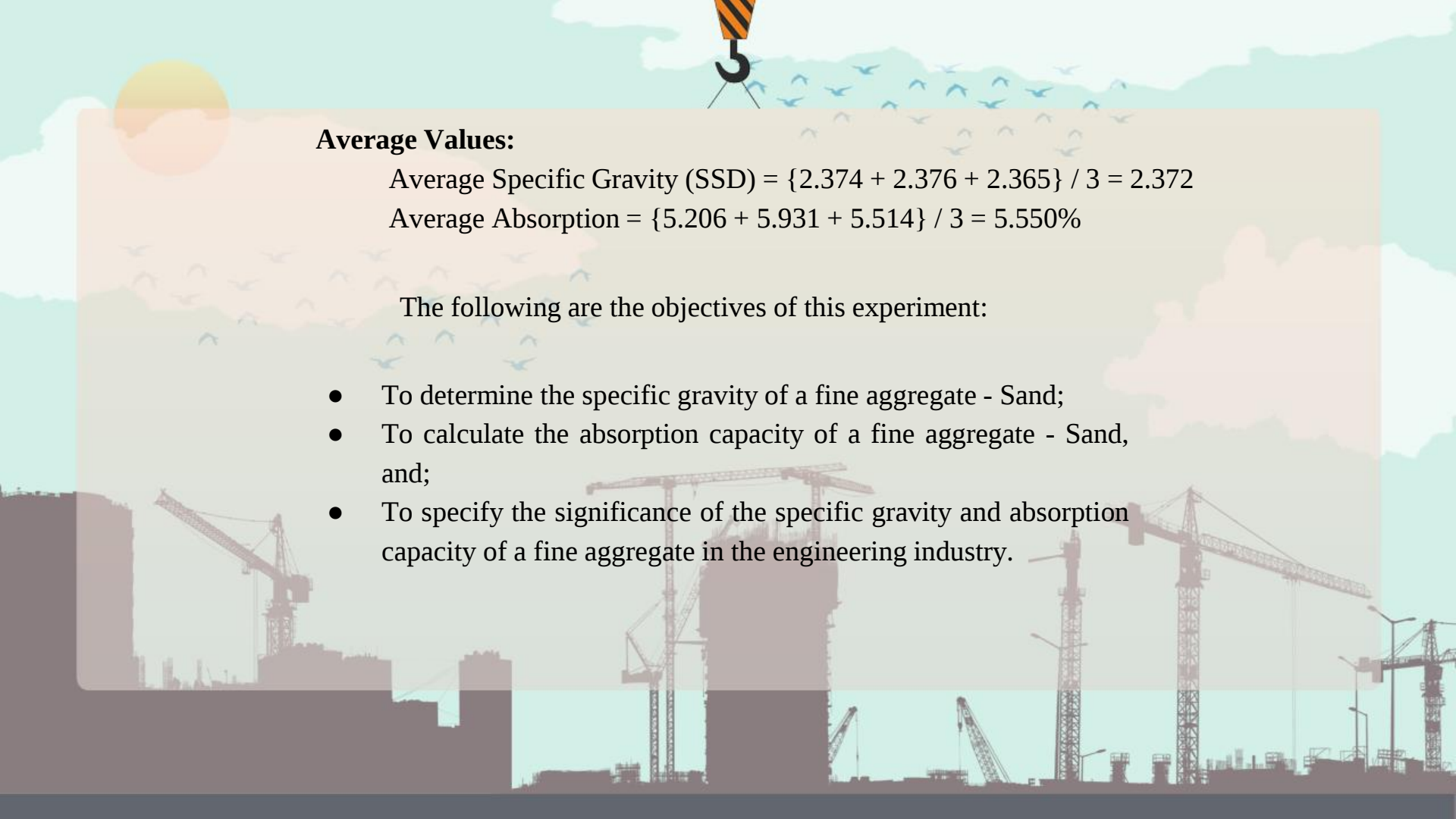
Test No. 3

Weight of SSD Sample (W_s) = $934.1 - 428.9 = 505.2$ g

Specific Gravity = $505.2 / \{500 - 966.9 + 175.3 + 500.1\} = 2.365$

Weight of Oven-Dried Sample = $907.7 - 428.8 = 478.8$ g

Absorption = $100 \times \{505.2 - 478.8\} / 478.8 = 5.514\%$



Average Values:

Average Specific Gravity (SSD) = $\{2.374 + 2.376 + 2.365\} / 3 = 2.372$

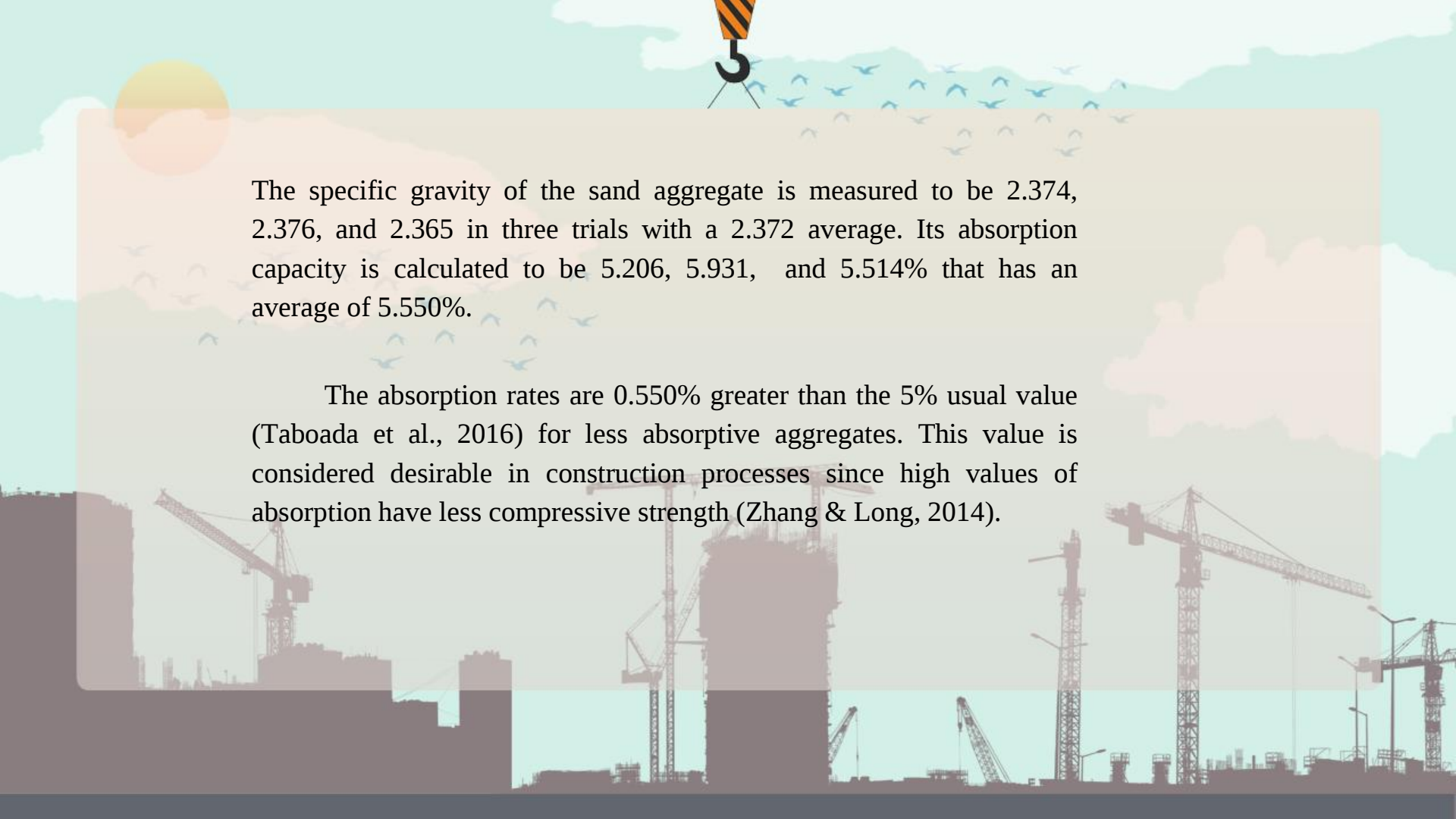
Average Absorption = $\{5.206 + 5.931 + 5.514\} / 3 = 5.550\%$

The following are the objectives of this experiment:

- To determine the specific gravity of a fine aggregate - Sand;
- To calculate the absorption capacity of a fine aggregate - Sand, and;
- To specify the significance of the specific gravity and absorption capacity of a fine aggregate in the engineering industry.

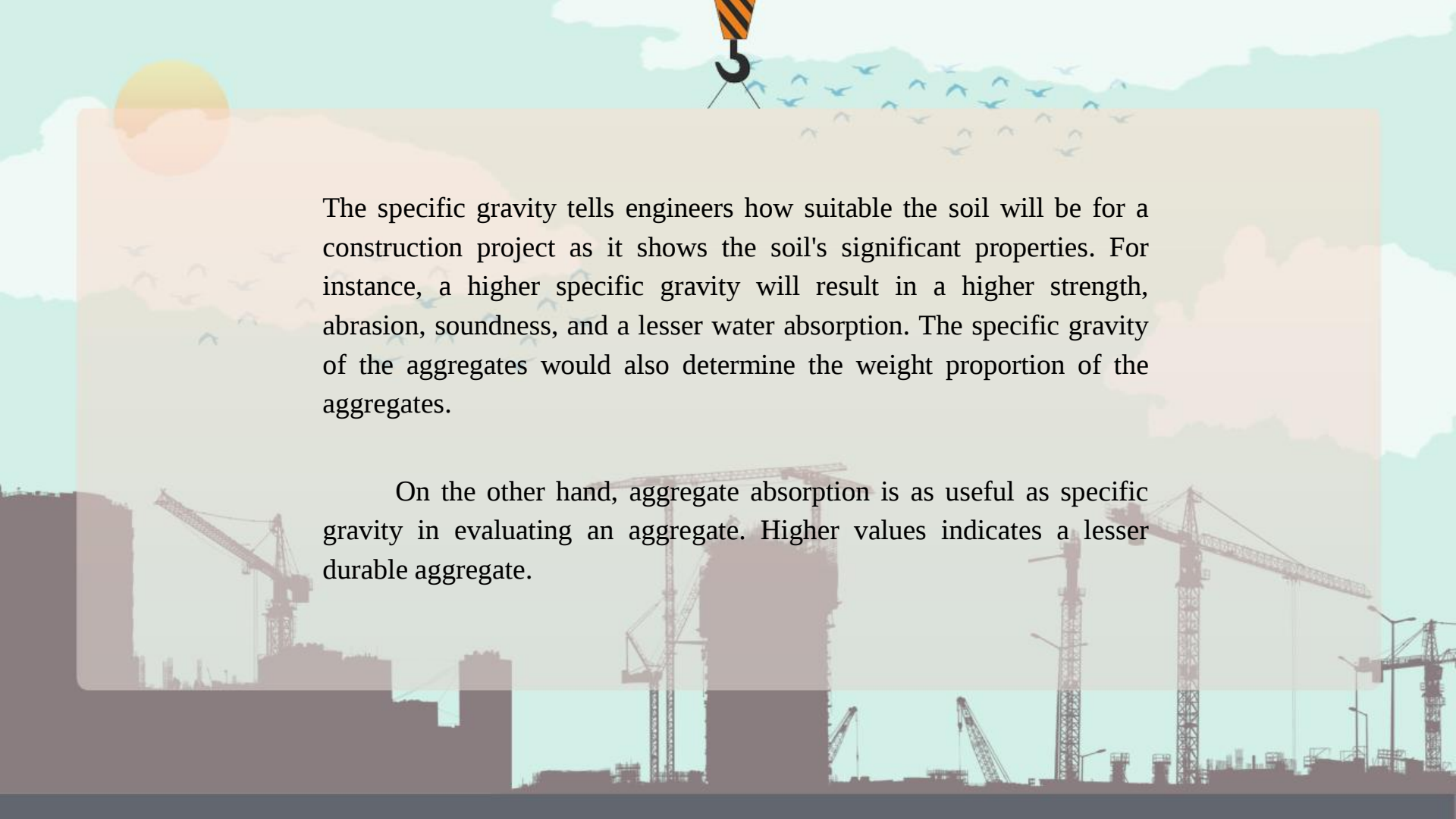


CONCLUSION



The specific gravity of the sand aggregate is measured to be 2.374, 2.376, and 2.365 in three trials with a 2.372 average. Its absorption capacity is calculated to be 5.206, 5.931, and 5.514% that has an average of 5.550%.

The absorption rates are 0.550% greater than the 5% usual value (Taboada et al., 2016) for less absorptive aggregates. This value is considered desirable in construction processes since high values of absorption have less compressive strength (Zhang & Long, 2014).



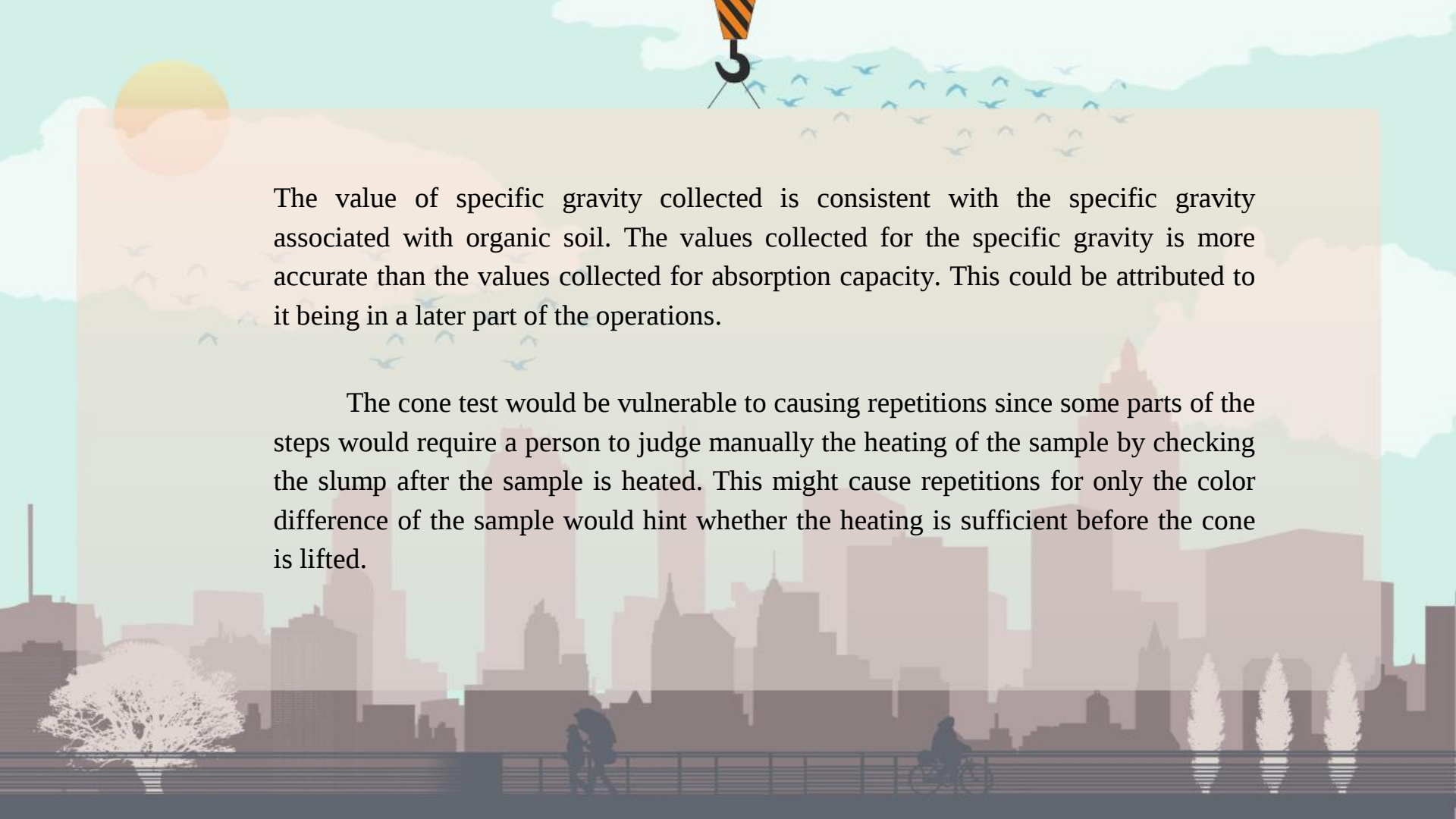
The specific gravity tells engineers how suitable the soil will be for a construction project as it shows the soil's significant properties. For instance, a higher specific gravity will result in a higher strength, abrasion, soundness, and a lesser water absorption. The specific gravity of the aggregates would also determine the weight proportion of the aggregates.

On the other hand, aggregate absorption is as useful as specific gravity in evaluating an aggregate. Higher values indicates a lesser durable aggregate.



THINGS LEARNED

FROM THE EXPERIMENT

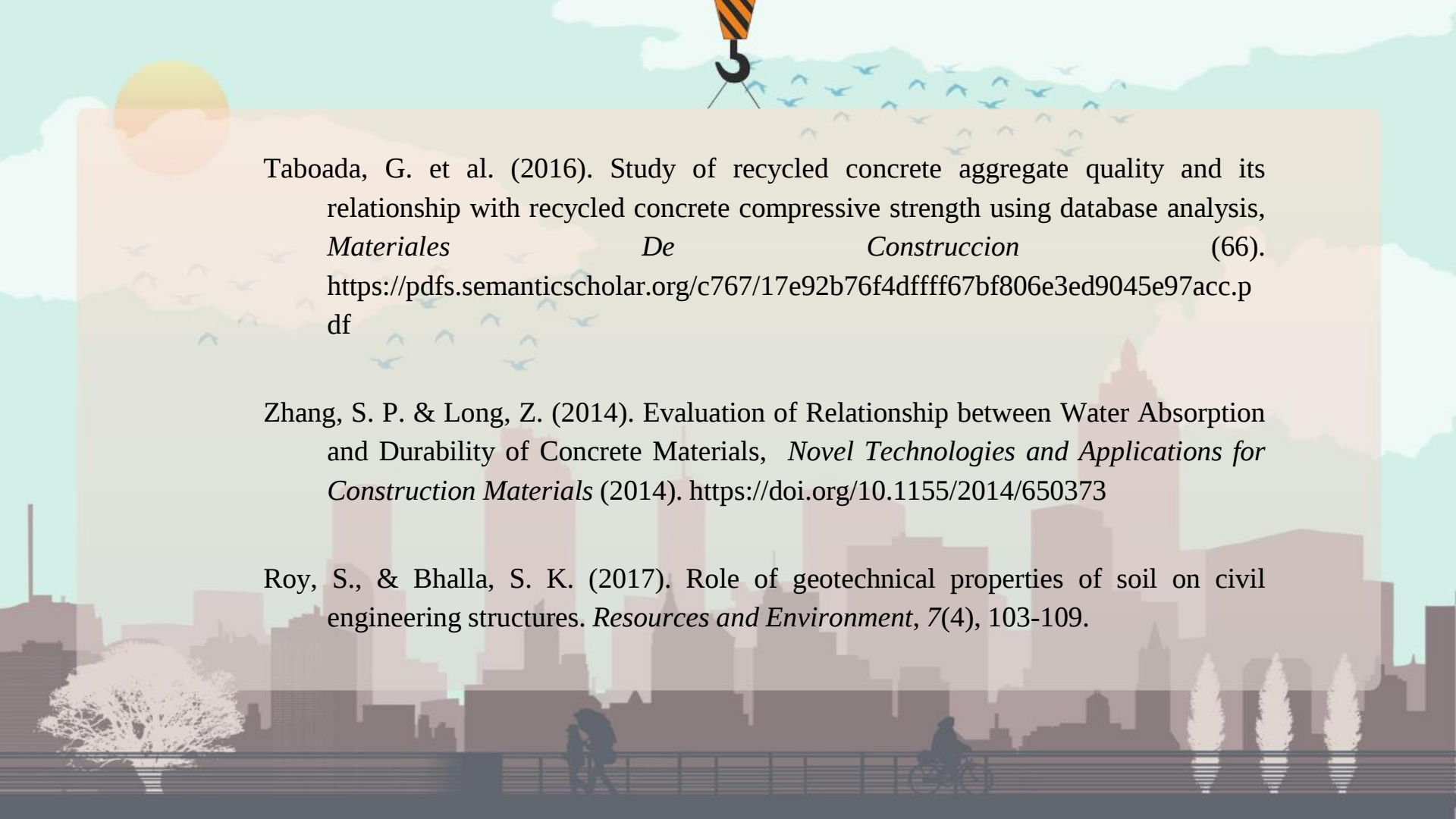
The background of the slide features a stylized city skyline at sunset. The sky is a gradient of light blue and orange, with a large yellow sun in the upper left. Numerous small blue birds are scattered across the sky. A crane hook with orange and black stripes is visible at the top center. The city skyline is rendered in dark purple and blue silhouettes, with a few trees and a person walking with a dog and a person on a bicycle in the foreground.

The value of specific gravity collected is consistent with the specific gravity associated with organic soil. The values collected for the specific gravity is more accurate than the values collected for absorption capacity. This could be attributed to it being in a later part of the operations.

The cone test would be vulnerable to causing repetitions since some parts of the steps would require a person to judge manually the heating of the sample by checking the slump after the sample is heated. This might cause repetitions for only the color difference of the sample would hint whether the heating is sufficient before the cone is lifted.



REFERENCES

The background of the slide features a stylized illustration. At the top, a yellow sun is on the left, and a crane with a black and yellow striped hook is in the center. Numerous blue birds are flying across the sky. The middle section is a large, light-orange rectangular area containing the text. The bottom of the slide shows a dark silhouette of a city skyline with various buildings. In the foreground, there are silhouettes of people: a person walking with a backpack, a person riding a bicycle, and a person standing. There are also some stylized trees and bushes.

Taboada, G. et al. (2016). Study of recycled concrete aggregate quality and its relationship with recycled concrete compressive strength using database analysis, *Materiales De Construccion* (66).
<https://pdfs.semanticscholar.org/c767/17e92b76f4dffff67bf806e3ed9045e97acc.pdf>

Zhang, S. P. & Long, Z. (2014). Evaluation of Relationship between Water Absorption and Durability of Concrete Materials, *Novel Technologies and Applications for Construction Materials* (2014). <https://doi.org/10.1155/2014/650373>

Roy, S., & Bhalla, S. K. (2017). Role of geotechnical properties of soil on civil engineering structures. *Resources and Environment*, 7(4), 103-109.